KURIKULUM STANDARD SEKOLAH MENENGAH

MATHEMATICS
FORM 3

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Introduction

This Form 3 Mathematics Textbook is prepared based on *Kurikulum Standard Sekolah Menengah (KSSM)*. This book contains 9 chapters arranged systematically based on Form 3 Mathematics *Dokumen Standard Kurikulum dan Pentaksiran (DSKP)*.

At the beginning of each chapter, students are introduced to stimulating materials related to daily life to stimulate their thinking about the topic. In addition, Learning Standard and word list also give a visual summary about the chapter's content.

This book contains the following special features:

	Description
What will you learn?	Contains learning standard that students will learn in each chapter.
Why do you learn this chapter?	Applications of knowledge in this chapter in related career fields.
Exploring Era	History of ancient academy or original exploration of the chapter in Mathematics.
WORD BANK	Word list contained in each chapter.
Brainstorming — Individual, In pairs, In groups	Helps students to understand the basic mathematical concept via individual, pair or group activities.
BULLETIN	Gives additional information about the chapter learned.
QUIZ	Questions that test students' capability to understand certain technique in each chapter.
REMINDER	Grabs students' attention to additional facts that need to be reminded of, mistakes that students commonly make, and carelessness to be avoided.
TIPS	Exposes students to additional knowledge that they need to know.
SMART MIND	Presents mind-stimulating questions for enhancement of students' critical and creative thinking.

	Description
SMART TECHNOLOGY	Exposes students to the use of technological tools in the learning of mathematics.
DISCUSSION CORNER	Develops communication skills mathematically.
FLASHBACK	Helps students to remember what they have learnt.
SMART FINGER	Shows the use of scientific calculators in calculations.
PROJECT	Enables students to carry out assignments and then present their completed work in class.
MIND TEST	Test students' understanding on the concepts they have learnt.
	Indicates HOTS questions to help in developing students' higher order thinking skills.
Dynamic Challenge	Prepares more diversified exercises which incorporate the elements of LOTS, HOTS, TIMSS and PISA assessment.
	Enables students to scan QR Code using mobile device.
EXPLORING MATHEMATICS	Covers applicable concepts of digital tool calculators, hands on activities and games that aim to provides additional activities to effectively enhance students' understanding.
CONCEPT MAP	Overall chapter summary that students learnt.
SELF-REFLECT	Looks back whether students have achieved the learning standard.
Checking Answers	Checks answers with alternative methods.
STEM	Activities with elements of Science, Technology, Engineering and Mathematics.

Symbols and Formulae

SYMBOLS

$\sqrt{\ }$	root
π	pi
$a : b$	ratio of a to b
$A \times 10^n$	standard form where $1 \leqslant A < 10$ and n is an integer
$=$	is equal to
$\approx$	is approximately equal to
$\neq$	is not equal to
$>$	is more than
$\geqslant$	is more than or equal to
$<$	is less than
$\leqslant$	is less than or equal to
Δ	triangle
$\angle$	angle
$^\circ$	degree
$'$	minute
$''$	second

FORMULAE

$a^m \times a^n = a^{m+n}$

$a^m \div a^n = a^{m-n}$

$(a^m)^n = a^{mn}$

$a^0 = 1$

$a^{-n} = \frac{1}{a^n}$

$a^{\frac{1}{n}} = \sqrt[n]{a}$

$a^{\frac{m}{n}} = (a^m)^{\frac{1}{n}} = (a^{\frac{1}{n}})^m$

$a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$

$I = Prt$

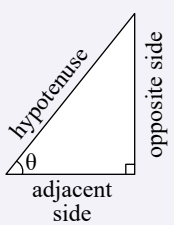
$MV = P(1 + \frac{r}{n})^{nt}$

$A = P + Prt$

$\sin\theta = \dfrac{\text{opposite side}}{\text{hypotenuse}}$

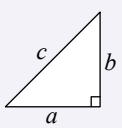
$\cos\theta = \dfrac{\text{adjacent side}}{\text{hypotenuse}}$

$\tan\theta = \dfrac{\text{opposite side}}{\text{adjacent side}}$



$\tan\theta = \dfrac{\sin\theta}{\cos\theta}$

Pythagorean theorem:



$c^2 = a^2 + b^2$

$b^2 = c^2 - a^2$

$a^2 = c^2 - b^2$

Distance between two points $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Midpoint $= \left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

Gradient, $m = \dfrac{\text{vertical distance}}{\text{horizontal distance}}$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$m = -\dfrac{y\text{-intercept}}{x\text{-intercept}}$

http://bukutekskssm.my/Mathematics/F3/Index.html

Download the free *QR Code* scanner to your mobile devices. Scan *QR Code* or visit the website http://bukutekskssm.my/Mathematics/F3/Index.html to download files for brainstorming. Then, save the downloaded file for offline use.

Note: Students can download free *GeoGebra and Geometer's Sketchpad* (*GSP*) software to open related files.

Answers

CHAPTER 1 Indices

MIND TEST 1.1a

1.

Base	Index
5	3
-4	7
$\frac{1}{2}$	10
m	6
n	0
0.2	9
$-\frac{3}{7}$	4
x	20
$2\frac{1}{3}$	2
8	1

2. (a) 6^6
(b) $(0.5)^7$
(c) $\left(\frac{1}{2}\right)^4$
(d) $(-m)^5$
(e) $\left(1\frac{2}{3}\right)^3$
(f) $\left(-\frac{1}{n}\right)^6$

3. (a) $(-3) \times (-3) \times (-3)$
(b) $2.5 \times 2.5 \times 2.5 \times 2.5$
(c) $\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3}$
(d) $(-2\frac{1}{4}) \times (-2\frac{1}{4}) \times (-2\frac{1}{4})$
(e) $k \times k \times k \times k \times k \times k$
(f) $(-p) \times (-p) \times (-p) \times (-p) \times (-p) \times (-p) \times (-p)$
(g) $\frac{1}{m} \times \frac{1}{m} \times \frac{1}{m} \times \frac{1}{m} \times \frac{1}{m} \times \frac{1}{m} \times \frac{1}{m} \times \frac{1}{m}$
(h) $(3n) \times (3n) \times (3n) \times (3n) \times (3n)$

MIND TEST 1.1b

1. (a) 3^4 (b) 5^6 (c) $\left(\frac{4}{5}\right)^3$
(d) $(0.2)^5$ (e) $(-4)^7$ (f) $\left(-\frac{1}{4}\right)^2$

MIND TEST 1.1c

1. (a) 6 561 (b) −1 024 (c) 15.625
(d) −32.768 (e) $\frac{243}{32\,768}$ (f) $\frac{1}{1\,296}$
(g) $2\frac{7}{9}$ (h) $-12\frac{19}{27}$

MIND TEST 1.2a

1. (a) 3^7 (b) $(-0.4)^8$ (c) $\left(\frac{4}{7}\right)^9$
(d) $\left(-1\frac{2}{5}\right)^{10}$ (e) $-6m^9$ (f) $\frac{n^{12}}{5}$
(g) $-15x^7$ (h) y^{12}

MIND TEST 1.2b

1. (a) $5^5 \times 9^5$ (b) $(0.4)^3 \times (1.2)^9$
(c) $4x^6y^7$ (d) $-\frac{3}{2}k^6p^{11}$

MIND TEST 1.2c

1. (a) 4 (b) 7^2 (c) m^4n^5
(d) $3xy^3$ (e) m (f) $-5h$

2. (a) $8^{\boxed{8}} \div 8^4 \div 8^3 = 8$
(b) $m^4n^{\boxed{6}} \div m^{\boxed{2}}n^5 = m^2n$
(c) $\frac{m^{10}n^4 \times m^{\boxed{2}}n^2}{m^7n} = m^5n^{\boxed{5}}$
(d) $\frac{27x^3y^6 \times xy^{\boxed{2}}}{\boxed{9}x^2y^3} = 3x^{\boxed{2}}y^5$

3. 8

MIND TEST 1.2d

1. (a) 12^{10} (b) 3^{20} (c) 7^6 (d) $(-4)^{21}$
(e) k^{24} (f) g^{26} (g) $(-m)^{12}$ (h) $(-c)^{21}$

2. (a) True (b) False (c) False (d) False

MIND TEST 1.2e

1. (a) $2^2 \times 3^8$ (b) $11^9 \times 9^{15}$ (c) $13^6 \div 7^{12}$
(d) $5^{15} \times 3^{20}$ (e) $m^{15}n^{20}p^{10}$ (f) $16w^8x^{12}$
(g) $\frac{729a^{30}}{b^{24}}$ (h) $\frac{8a^{15}}{27b^{12}}$

2. (a) $11^2 \times 4^4$ (b) $3^3 \times 6^2$ (c) $\frac{4^4}{6^6}$
(d) $(-4)^6 \times (-5)^4$ (e) x^4y^4
(f) $h^{10}k^6$ (g) $m^{11}n^{15}$ (h) b^2d^6

3. (a) $6mn^8$ (b) $10x^8y^3$ (c) de

MIND TEST 1.2f

1. (a) $\frac{1}{5^3}$ (b) $\frac{1}{8^4}$ (c) $\frac{1}{x^8}$ (d) $\frac{1}{y^{16}}$
(e) a^4 (f) 20^2 (g) $\frac{3}{n^4}$ (h) $-\frac{5}{n^6}$
(i) $\frac{2}{7m^5}$ (j) $-\frac{3}{8m^4}$ (k) $\left(\frac{5}{2}\right)^{12}$ (l) $\left(-\frac{7}{3}\right)^{14}$
(m) $\left(\frac{y}{x}\right)^{10}$ (n) $\left(\frac{3y}{2x}\right)^4$ (o) $(2x)^5$

2. (a) 5^{-4} (b) 8^{-3} (c) m^{-7} (d) n^{-9}
(e) $\frac{1}{10^{-2}}$ (f) $\frac{1}{(-4)^{-3}}$ (g) $\frac{1}{m^{-12}}$ (h) $\frac{1}{n^{-16}}$
(i) $\left(\frac{7}{4}\right)^{-9}$ (j) $\left(\frac{y}{x}\right)^{-10}$

3. (a) $\frac{1}{4}$ (b) $\frac{2^4}{3^{14}}$ (c) $2^6 \times 5^2$
(d) $\frac{1}{3m^3n^7}$ (e) $\frac{1}{8m^8}$ (f) $\frac{m^6n}{18}$

MIND TEST 1.2g

1. (a) $125^{\frac{1}{3}}$ (b) $2\,187^{\frac{1}{7}}$ (c) $(-1\,024)^{\frac{1}{5}}$ (d) $n^{\frac{1}{10}}$

2. (a) $\sqrt{4}$ (b) $\sqrt[5]{32}$ (c) $\sqrt[3]{-729}$ (d) $\sqrt[15]{n}$

3. (a) 7 (b) −6 (c) 8 (d) −8

MIND TEST 1.2h

$a^{\frac{m}{n}}$	$729^{\frac{5}{6}}$	$121^{\frac{3}{2}}$	$w^{\frac{3}{7}}$	$x^{\frac{2}{5}}$	$\left(\frac{16}{81}\right)^{\frac{3}{4}}$	$\left(\frac{h}{k}\right)^{\frac{2}{3}}$
$(a^m)^{\frac{1}{n}}$	$(729^5)^{\frac{1}{6}}$	$(121^3)^{\frac{1}{2}}$	$(w^3)^{\frac{1}{7}}$	$(x^2)^{\frac{1}{5}}$	$\left[\left(\frac{16}{81}\right)^3\right]^{\frac{1}{4}}$	$\left[\left(\frac{h}{k}\right)^2\right]^{\frac{1}{3}}$
$(a^{\frac{1}{n}})^m$	$(729^{\frac{1}{6}})^5$	$(121^{\frac{1}{2}})^3$	$(w^{\frac{1}{7}})^3$	$(x^{\frac{1}{5}})^2$	$\left[\left(\frac{16}{81}\right)^{\frac{1}{4}}\right]^3$	$\left[\left(\frac{h}{k}\right)^{\frac{1}{3}}\right]^2$
$\sqrt[n]{a^m}$	$\sqrt[6]{729^5}$	$\sqrt{121^3}$	$\sqrt[7]{w^3}$	$\sqrt[5]{x^2}$	$\sqrt[4]{\left(\frac{16}{81}\right)^3}$	$\sqrt[3]{\left(\frac{h}{k}\right)^2}$
$(\sqrt[n]{a})^m$	$(\sqrt[6]{729})^5$	$(\sqrt{121})^3$	$(\sqrt[7]{w})^3$	$(\sqrt[5]{x})^2$	$\left(\sqrt[4]{\frac{16}{81}}\right)^3$	$\left(\sqrt[3]{\frac{h}{k}}\right)^2$

MIND TEST 1.2i

1. (a) 9 (b) 4 (c) 4 (d) 8
(e) 256 (f) 16 (g) 216 (h) 343
(i) 7 (j) 1 331 (k) 169 (l) 1 000

2. (a) $\sqrt[2]{6\ 561}^{[1]}$; $3^{[4]}$; $9^{[2]}$; $81^{[1]}$; $243^{[5]}$; $27^{[3]}$
(b) $25^{[2]}$; $125^{[1]}$; $625^{[4]}$; $\sqrt[2]{15\ 625}^{[1]}$; $3\ 125^{[5]}$; $5^{[3]}$

MIND TEST 1.2j

1. (a) $\frac{c^7}{de}$ (b) mn^6 (c) $\frac{10x}{3z^2}$

2. (a) $\frac{1}{2\ 401}$ (b) 648 (c) 86 400
(d) $\frac{7}{54}$ (e) 81 (f) $\frac{125}{8}$

3. 3 456 **4.** 48

Dynamic Challenge

Test Yourself

1. (a) True (b) False (25) (c) False (1)
(d) False ($32x^{15}$) (e) True (f) False $\left(\frac{2}{a^4}\right)$
(g) False $[(\sqrt[5]{32})^2]$ (h) True (i) False $\left(\frac{1}{625\text{ m}}\right)$

2.

$5^{[4]} \times 5^5$	$5^{3(\square)}$
$5^{12} \div 5^{[3]}$	$(\sqrt{25})^{[9]}$
$\left(\frac{1}{5}\right)^{[-9]}$	$(\sqrt[3]{125})^{[9]}$
$(5^{[6]})^{\frac{3}{2}}$	$\frac{5^6 \times 5^{[5]}}{5^2}$
$\frac{1}{5^{[-9]}}$	$\left(\frac{1}{5^{[3]}}\right)^3$

3.

2^0	as	$\frac{1}{3^{-4}}$	as	$\left(\frac{3}{5}\right)^{-2}$	as	$7^2 \times 5^{-3}$	as	$(5^{-1} \times \sqrt{25})^3$
1		3^4		$(\frac{5}{3})^2$		$\frac{7^2}{5^3}$		1

Skills Enhancement

1. (a) $\frac{n^7}{m}$ (b) $\frac{x^4y^7}{2}$ (c) xy^2

2. (a) $\frac{4}{125}$ (b) $\frac{25}{7}$ (c) 1 (d) 2 (e) 7 (f) 1

3. (a) 3 (b) 0 (c) –8
(d) –5 (e) 5 (f) 2
(g) 2 (h) –1 (i) 1

Self Mastery

1. (a) 1 000 (b) 500 000 (c) 50

2. (a) $\frac{3}{4}$ (b) $\frac{3}{2}$ (c) 15

3. (a) –1, 6 (b) 1, –7 (c) –1, 4

4. (a) $x = \frac{1}{6}, y = 2$ (b) $x = 1, y = -\frac{2}{3}$

5. 12°C **6.** RM27 130 **7.** RM61 462.77

CHAPTER 2 Standard Form

MIND TEST 2.1a

1. (a) 2 s.f. (b) 5 s.f. (c) 5 s.f. (d) 4 s.f.
(e) 2 s.f. (f) 5 s.f. (g) 4 s.f. (h) 6 s.f.

MIND TEST 2.1b

1.

(a)	47 200	47 000	50 000
(b)	5 260	5 300	5 000
(c)	306	310	300
(d)	20.7	21	20
(e)	8.60	8.6	9
(f)	5.90	5.9	6
(g)	0.694	0.69	0.7
(h)	0.0918	0.092	0.09
(i)	0.00571	0.0057	0.006

2. (a) 12.02 (b) 2.83 (c) 11.1
(d) 24 (e) 6.61 (f) 13
(g) 20 (h) 36.0

MIND TEST 2.2a

1. (a) 3.5×10^1 (b) 4.81×10^2
(c) 5.075×10^3 (d) 9.725×10^1
(e) 3.1243×10^3 (f) 9.0×10^{-1}
(g) 2.3×10^{-1} (h) 3.75×10^{-2}

2. (a) 2.5 (b) 37.5 (c) 423
(d) 5 070 (e) 91 000 (f) 0.62
(g) 0.0729 (h) 0.001034 (i) 0.0008504

3. (a) 1.05×10^6 metres (b) 2.16×10^{11} bytes
(c) 7.5×10^{11} litres (d) 9.5×10^{-5} metres
(e) 1.23×10^{-7} metres (f) 8.9×10^{-17} metres

MIND TEST 2.2b

1. (a) 5.97×10^4 (b) 3.93×10^6
(c) 1.021×10^8 (d) 1.574×10^5
(e) 5.46×10^8 (f) 8.59×10^4
(g) 5.77×10^4 (h) 1.08×10^{-3}
(i) 6.09×10^{-5} (j) 9.91×10^{-3}
(k) 7.68×10^{-4} (l) 8.685×10^{-6}

MIND TEST 2.2c

1. (a) 1.48×10^8 (b) 3.75×10^{-8}
(c) 2.52×10^8 (d) 2.12×10^3
(e) 4.5×10^{-3} (f) 6.4×10^3
(g) 2.95×10^3 (h) 8.6×10^8

2. 3.126×10^3 **3.** 63 **4.** 10^3 micrometres

MIND TEST 2.2d

1. $2.02 \times 10^5\ m^3$
2. (a) 9.17×10^7 km (b) 4.44×10^9 km (c) 4.35×10^9 km

Dynamic Challenge

Test Yourself

1. (a) 24 000 (b) 54 300 (c) 9 000 (d) 300 000
   (e) 5 000 (f) 5.00 (g) 0.28 (h) 40
   (i) 420 (j) 10 (k) 1.04 (l) 502
2. (a) 3.48×10^8 (b) 5.75×10^4 (c) 5.11×10^4
   (d) 2.96×10^9 (e) 8.84×10^{-2} (f) 3.31×10^{-4}
   (g) 9.77×10^{-8} (h) 5.43×10^4
3. (a) –2, 0.025, 0.025, 1.35, 1.375
   (b) –3, 0.0034, 5.74, 0.0034, 5.7434
   (c) –3, 0.0042, 1.75, 0.0042, 1.7458
   (d) –3, 0.0043, 3.7, 0.0043, 3.657
4. (a) 1.2×10^4 (b) RM214 **5.** 97 people

Skills Enhancement

1. (a) $5.57 \times 10^2\ m^2$ (b) RM10 824
2. (a) (i) $70.9\ kmh^{-1}$ (ii) $47.1\ kmh^{-1}$ (iii) $68.4\ kmh^{-1}$

Self Mastery

1. (a) Mercury = $7.48 \times 10^7\ km^2$
   Neptune = $7.62 \times 10^9\ km^2$
   Jupiter = $6.14 \times 10^{10}\ km^2$
   (b) $6.133 \times 10^{10}\ km^2$
2. (a) 4.37 g (b) 4.99 g

CHAPTER 3 Consumer Mathematics: Savings and Investments, Credit and Debt

MIND TEST 3.1a

1. • For a well-planned life in the future
   • As an additional income
   • For emergency use
2. • Open a Fixed Deposit Account
   • This is because the money will not be used for a given period
   • Higher interest rates are also offered
3. Cheques are commonly used by businessmen/businesswomen for payments in large amounts while most people only make daily payments in small amounts.

MIND TEST 3.1b

1. RM610.10 **2.** RM1 159.70 **3.** RM106.17

MIND TEST 3.1c

1. Return on investment is the value of return of the investment.
2. (a) RM2 000
   (b) RM24 000 + RM230 000 = RM254 000
3. RM320

MIND TEST 3.1d

1. The higher the risk, the higher the return.
2. Bank Negara Malaysia guarantees on deposits in the bank.
3. It can be cashed immediately.
4. Real estate's price usually increases but rarely falls.
5. (a) Real estate
   (b) Risk potential = Low
   Return = High
   Liquidity = Low
   (c) Mr Osman's action is wise because our country focuses on the tourism sector. Therefore, it is appropriate to set up the homestay. Besides, the investment in the homestay has low risk.

MIND TEST 3.1e

1. Purchase of shares every month or periodically but not at a lump sum.
2. (a) Investor 2. This is because the purchase of 2 shares on a regular basis allows him to purchase many units of shares and the average cost per unit can be reduced.
   (b) RM1.80. 13 268 units of shares
   (c) • The average cost per unit share can be reduced
   • Reduce the risk of loss

MIND TEST 3.1f

1. (a) Mr Rasamanie – Real estates (Low Risk)
   Mr Nik Izwan – Savings (Low Risk)
   Real estates (Low Risk)
   Shares (High Risk)
   (b) Mr Nik Izwan. This is because if there is a loss in one of the investments, it can be covered by other investments.
   (c) Economic factor and political factor of the location of the real estate.
2. 23.16%

MIND TEST 3.2a

1. Personal loans are short term loans for consumer use.
2. • Prepare your budget
   • Plan your expenses
3. Credit card – He is not require to pay interest if his debts are settled in interest-free period as compared to loan.

Dynamic Challenge

Test Yourself

1. Savings is the balance after making mandatory expenditure from salary.
2. • High interest rate.
   • Savings period is subject to a specified time.
3. RM8 640

Skills Enhancement

1. Increase the number of shares purchased and the average cost per unit will be lower than if purchased all at once.
2. Purchase of land lots, houses, factories and so on.
3. (a) Dividend (b) Capital gain (c) Bonus share
4. (a) Lee Chong needs to have the knowledge to assess and select shares while Mokhtar's investment is assisted by a professional company.
   (b) Lee Chong's risk is higher compared to Mokhtar's.
5. RM300 **6.** (a) RM360 (b) 3 000 units (c) 9 000 units
7. RM1 000, 3%, 3 years **8.** RM634.12

Self Mastery

1. RM3 750
2. 8.85%
3. RM7 000
4. RM400
5. RM233.33
6. RM52.87
7. (a) Masnah Rasam's view is not recommended because she has to pay interest.
   (b) RM320, 8%
   (c) Cash, because no interest needs to be paid.
8. RM15 000
9. 4%
10. RM900

CHAPTER 4 Scale Drawings

MIND TEST 4.1a

1. Diagram 1, Diagram 2, Diagram 4

MIND TEST 4.1b

1. (a) $1 : \frac{1}{2}$ (b) $1 : 3$ (c) $1 : \frac{1}{2}$ (d) $1 : \frac{2}{3}$
2. Length = 6 cm Width = 2 cm
3. 10 km
4. 6 cm

MIND TEST 4.1c

2. (b) (i) $1 : \frac{1}{2}$ (ii) $1 : 2$

MIND TEST 4.1d

1. 1 944 cm^2
2. 34.8 cm
3. 560 m^2
4. 20 cm
5. (a) 7 200 m^2
   (b) 2 hours 24 minutes

Dynamic Challenge

Test Yourself

1. $1 : \frac{1}{5}$
2. (a) I and III
   (b) I = 1 : 2
   III = $1 : \frac{1}{2}$
   (c) (i) I = 1.5 cm^2
   III = 24 cm^2
   (ii) I = 1 : 4
   III = $1 : \frac{1}{4}$
   The ratio of area is not proportional to the scale of the scale drawings.
3. (a) 17.0 cm
   (b) 203.5 m^2

Skills Enhancement

1. 540 kmh^{-1}
2. 50 cm × 50 cm tile. RM633.20 can be saved.
3. (a) 2 829 m^2
   (b) 4 : 13
   (c) 1 971 m^2
   (d) RM3 960

Self Mastery

1. (a) 48 m^2 (b) 8 : 1 (c) 1 440 m^3
2. (a) 8 400 m^2
   (b) 1 : 500. The most relevant value for scale.
   (c) (i) 60 pieces
   (ii) RM31 500

CHAPTER 5 Trigonometric Ratios

MIND TEST 5.1a

Angle	Hypotenuse	Opposite side	Adjacent side
$\angle QPR$	PR	QR	PQ
$\angle PRQ$	PR	PQ	QR
$\angle MNK$	KN	KM	MN
$\angle MKN$	KN	MN	KM
$\angle FEG$	EG	FG	EF
$\angle EGF$	EG	EF	FG
$\angle BAE$	AE	BE	AB
$\angle AEB$	AE	AB	BE
$\angle BCD$	CD	BD	BC
$\angle BDC$	CD	BC	BD

MIND TEST 5.1b

ΔDEF

1. $\sin x = \frac{EF}{DF}$ $\cos x = \frac{DE}{DF}$ $\tan x = \frac{EF}{DE}$
   $\sin y = \frac{DE}{DF}$ $\cos y = \frac{EF}{DF}$ $\tan y = \frac{DE}{EF}$

ΔKLM

$\sin x = \frac{KL}{KM}$ $\cos x = \frac{LM}{KM}$ $\tan x = \frac{KL}{LM}$
$\sin y = \frac{LM}{KM}$ $\cos y = \frac{KL}{KM}$ $\tan y = \frac{LM}{KL}$

ΔPQR

$\sin x = \frac{QS}{PQ}$ $\cos x = \frac{PS}{PQ}$ $\tan x = \frac{QS}{PS}$
$\sin y = \frac{QS}{QR}$ $\cos y = \frac{RS}{QR}$ $\tan y = \frac{QS}{RS}$

MIND TEST 5.1c

1. Trigonometric ratios of angle x and angle y are the same. This is because all side lengths are reduced by the same rate.
2. (a) (i) $\frac{38}{145}$ (ii) $\frac{28}{29}$ (iii) $\frac{19}{70}$
   (iv) $\frac{1}{2}$ (v) $\frac{7}{8}$ (vi) $\frac{4}{7}$
   (b) No

MIND TEST 5.1d

1. (a) $\sin\theta = \frac{15}{39}$ $\cos\theta = \frac{12}{13}$ $\tan\theta = \frac{15}{36}$
   (b) $\sin\theta = \frac{24}{25}$ $\cos\theta = \frac{7}{25}$ $\tan\theta = \frac{24}{7}$
   (c) $\sin\theta = \frac{15}{17}$ $\cos\theta = \frac{8}{17}$ $\tan\theta = \frac{15}{8}$
   (d) $\sin\theta = \frac{5}{13}$ $\cos\theta = \frac{12}{13}$ $\tan\theta = \frac{5}{12}$
   (e) $\sin\theta = \frac{15}{17}$ $\cos\theta = \frac{8}{17}$ $\tan\theta = \frac{15}{8}$
   (f) $\sin\theta = 0.6$ $\cos\theta = 0.8$ $\tan\theta = 0.75$