

REVISION TEST 1 (Page 17)

This Revision Test covers the material contained in Chapter 1.

The marks available are shown at the end of each question.

Problem 1. Convert, correct to 2 decimal places: (a) 76.8° to radians (b) 1.724 radians to degrees.

	<u>Marks</u>
(a) $76.8^\circ = 76.8 \times \frac{\pi}{180} \text{ rad} = \mathbf{1.34 \text{ rad}}$	2
(b) $1.724 \text{ radians} = 1.724 \times \frac{180^\circ}{\pi} = \mathbf{98.78^\circ}$	2
Total:	4

Problem 2. In triangle JKL in Figure RT1.1, find (a) length KJ correct to 3 significant figures.

(b) $\sin L$ and $\tan K$, each correct to 3 decimal places.

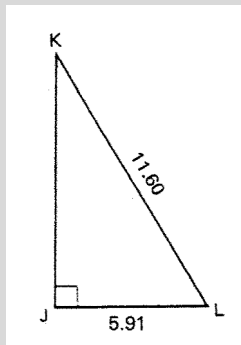


Figure RT1.1

	<u>Marks</u>
(a) By Pythagoras, $\mathbf{KJ} = \sqrt{11.60^2 - 5.91^2} = \mathbf{9.98}$	2
(b) $\sin L = \frac{KJ}{KL} = \frac{9.98}{11.60} = \mathbf{0.860}$	1
$\tan K = \frac{JL}{KJ} = \frac{5.91}{9.98} = \mathbf{0.592}$	1
Total:	4

Problem 3. In triangle PQR in Figure RT1.2, find angle P in decimal form, correct to 2 decimal places.

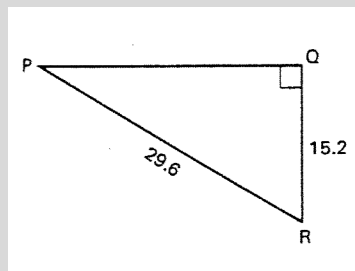


Figure RT1.2

	<u>Marks</u>
$\sin P = \frac{15.2}{29.6} = 0.51351\dots$	1
and $\angle P = \sin^{-1}(0.51351\dots) = \mathbf{30.90^\circ}$	1
Total:	2

Problem 4. In triangle ABC in Figure RT1.3, find lengths AB and AC, correct to 2 decimal places.

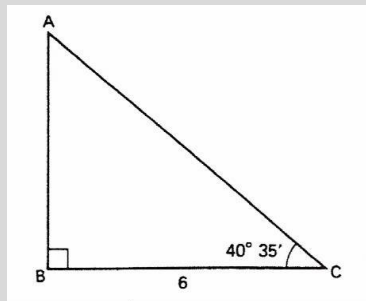


Figure RT1.3

	<u>Marks</u>
$\tan 40^\circ 35' = \frac{AB}{BC} = \frac{AB}{6}$ from which, $\mathbf{AB = 6 \tan 40^\circ 35' = 5.14}$	2
$\cos 40^\circ 35' = \frac{BC}{AC} = \frac{6}{AC}$ from which, $\mathbf{AC = \frac{6}{\cos 40^\circ 35'} = 7.90}$	2
(or use Pythagoras)	
Total:	4

Problem 5. A triangular plot of land ABC is shown in Figure RT1.4. Solve the triangle and determine its area.

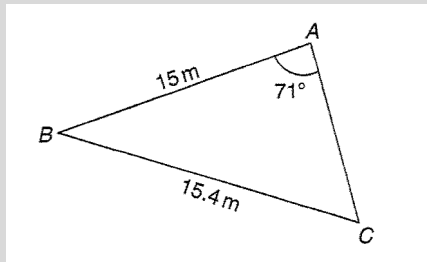


Figure RT1.4

	<u>Marks</u>
Using the sine rule: $\frac{15.4}{\sin 71^\circ} = \frac{15.0}{\sin C}$ from which, $\sin C = \frac{15.0 \sin 71^\circ}{15.4} = 0.9210$ and $\angle C = \sin^{-1} 0.9210 = \mathbf{67.07^\circ}$ Hence, $\angle B = 180^\circ - 71^\circ - 67.07^\circ = \mathbf{41.93^\circ}$ Using the sine rule again: $\frac{15.4}{\sin 71^\circ} = \frac{AC}{\sin 41.93^\circ}$ from which, $AC = \frac{15.4 \sin 41.93^\circ}{\sin 71^\circ} = \mathbf{10.88 \text{ m}}$ Area of triangle ABC = $\frac{1}{2} ac \sin B$ $= \frac{1}{2} (15.4)(15.0) \sin 41.93^\circ$ $= \mathbf{77.18 \text{ m}^2}$	3 1 3 2 9
Total:	

Problem 6. Figure RT1.5 shows a roof truss PQR with rafter PQ = 3 m. Calculate the length of (a) the roof rise PP', (b) rafter PR, and (c) the roof span QR. Find also (d) the cross-sectional area of the roof truss.

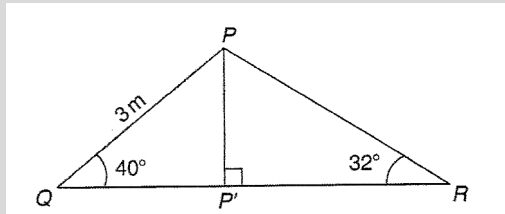
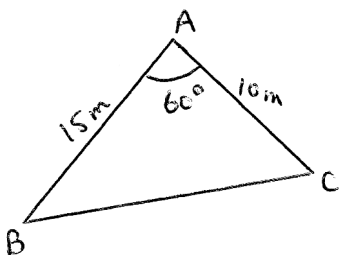


Figure RT1.5

	<u>Marks</u>
(a) In triangle PQP', $\sin 40^\circ = \frac{PP'}{3}$ from which, PP' = 3 sin 40° = 1.928 m	2
(b) From triangle PRP', $\sin 32^\circ = \frac{1.928}{PR}$ from which, PR = $\frac{1.928}{\sin 32^\circ} = 3.638$ m	2
(c) $\angle QPR = 180^\circ - 40^\circ - 32^\circ = 108^\circ$ Using the sine rule: $\frac{QR}{\sin 108^\circ} = \frac{3}{\sin 32^\circ}$ from which, QR = $\frac{3 \sin 108^\circ}{\sin 32^\circ} = 5.384$ m	1
(d) Cross-sectional area of roof truss = $\frac{1}{2} (QR)(PP')$ $= \frac{1}{2} (5.384)(1.928)$	3
	2

$= 5.190 \text{ m}^2$	10
Total:	

Problem 7. Solve triangle ABC given $b = 10 \text{ cm}$, $c = 15 \text{ cm}$ and $\angle A = 60^\circ$.

	<u>Marks</u>
Triangle ABC is shown below.	
	
Using the cosine rule: $BC^2 = 10^2 + 15^2 - 2(10)(15)\cos 60^\circ$	2
$= 175$	
and $BC = \sqrt{175} = 13.23 \text{ cm}$	1
Using the sine rule: $\frac{10}{\sin B} = \frac{13.23}{\sin 60^\circ}$	
from which, $\sin B = \frac{10 \sin 60^\circ}{13.23} = 0.654592\dots$	3
and $\angle B = \sin^{-1} 0.654592\dots = 40.89^\circ$	1
Hence, $\angle C = 180^\circ - 60^\circ - 40.89^\circ = 79.11^\circ$	7
Total:	

Problem 8. Remove the brackets and simplify: $2(3x - 2y) - (4y - 3x)$.

	<u>Marks</u>
$2(3x - 2y) - (4y - 3x) = 6x - 4y - 4y + 3x$	2

$= 9x - 8y$	1
Total:	3

Problem 9. Remove the brackets and simplify $10a - [3(2a - b) - 4(b - a) + 5b]$

	<u>Marks</u>
$10a - [3(2a - b) - 4(b - a) + 5b] = 10a - [6a - 3b - 4b + 4a + 5b]$	1
$= 10a - [10a - 2b]$	1
$= 10a - 10a + 2b$	1
$= 2b$	1
Total:	4

Problem 10. Determine, correct to 2 decimal places, 57% of 17.64 g.

	<u>Marks</u>
$57\% \text{ of } 17.64 \text{ g} = \frac{57}{100} \times 17.64$ $\text{g} = 10.05 \text{ g, correct to 2 decimal places}$	2
Total:	2

Problem 11. Express 54.7 mm as a percentage of 1.15 m, correct to 3 significant figures.

	<u>Marks</u>
54.7 mm as a percentage of 1.15 m is:	
$\frac{54.7}{1150} \times 100\% = 4.76\%, \text{ correct to 3 significant figures}$	3
Total:	3

Problem 12. Simplify: (a) $\frac{3}{4} - \frac{7}{15}$ (b) $1\frac{5}{8} - 2\frac{1}{3} + 3\frac{5}{6}$

	<u>Marks</u>
(a) $\frac{3}{4} - \frac{7}{15} = \frac{45-28}{60} = \frac{17}{60}$	2
(b) $1\frac{5}{8} - 2\frac{1}{3} + 3\frac{5}{6} = 1 + \frac{5}{8} - 2 - \frac{1}{3} + 3 + \frac{5}{6} = 2 + \frac{5}{8} - \frac{1}{3} + \frac{5}{6}$	2
$= 2 + \frac{15-8+20}{24}$	1
$= 2 + \frac{27}{24} = 2 + 1 + \frac{3}{24}$	2
$= 3\frac{1}{8}$	1
Total:	8

Problem 13. Evaluate: (a) $1\frac{7}{9} \times \frac{3}{8} \times 3\frac{3}{5}$ (b) $6\frac{2}{3} \div 1\frac{1}{3}$ (c) $1\frac{1}{3} \times 2\frac{1}{5} \div \frac{2}{5}$

	<u>Marks</u>
(a) $1\frac{7}{9} \times \frac{3}{8} \times 3\frac{3}{5} = \frac{16}{9} \times \frac{3}{8} \times \frac{18}{5} = \frac{2}{3} \times \frac{1}{1} \times \frac{18}{5} = \frac{2}{1} \times \frac{1}{1} \times \frac{6}{5} = \frac{12}{5} = 2\frac{2}{5}$	3
(b) $6\frac{2}{3} \div 1\frac{1}{3} = \frac{20}{3} \div \frac{4}{3} = \frac{20}{3} \times \frac{3}{4} = \frac{5}{1} \times \frac{1}{1} = 5$	3
(c) $1\frac{1}{3} \times 2\frac{1}{5} \div \frac{2}{5} = \frac{4}{3} \times \frac{11}{5} \div \frac{2}{5} = \frac{4}{3} \times \frac{11}{5} \times \frac{5}{2} = \frac{2}{3} \times \frac{11}{1} \times \frac{1}{1} = \frac{22}{3} = 7\frac{1}{3}$	4
Total:	10

Problem 14. Evaluate: (a) $3 \times 2^3 \times 2^2$ (b) $49^{\frac{1}{2}}$

	<u>Marks</u>
(a) $3 \times 2^3 \times 2^2 = 3 \times 8 \times 4 = \mathbf{96}$	2
(b) $49^{\frac{1}{2}} = \sqrt{49} = \pm \mathbf{7}$	2
Total:	4

Problem 15. Evaluate: (a) $\frac{2^7}{2^2}$ (b) $\frac{10^4 \times 10 \times 10^5}{10^6 \times 10^2}$

	<u>Marks</u>
(a) $\frac{2^7}{2^2} = 2^{7-2} = 2^5 = \mathbf{32}$	2
(b) $\frac{10^4 \times 10 \times 10^5}{10^6 \times 10^2} = 10^{4+1+5-6-2} = 10^2 = \mathbf{100}$	2
Total:	4

Problem 16. Evaluate: (a) $\frac{2^3 \times 2 \times 2^2}{2^4}$ (b) $\frac{(2^3 \times 16)^2}{(8 \times 2)^3}$ (c) $\left(\frac{1}{4^2}\right)^{-1}$

	<u>Marks</u>
(a) $\frac{2^3 \times 2 \times 2^2}{2^4} = 2^{3+1+2-4} = 2^2 = \mathbf{4}$	2
(b) $\frac{(2^3 \times 16)^2}{(8 \times 2)^3} = \frac{(2^3 \times 2^4)^2}{(2^3 \times 2)^3} = \frac{(2^7)^2}{(2^4)^3} = \frac{2^{14}}{2^{12}} = 2^{14-12} = 2^2 = \mathbf{4}$	3
(c) $\left(\frac{1}{4^2}\right)^{-1} = (4^2)^{+1} = 4^2 = \mathbf{16}$	2
Total:	7

Problem 17. Evaluate: (a) $(27)^{-\frac{1}{3}}$

(b) $\frac{\left(\frac{3}{2}\right)^{-2} - \frac{2}{9}}{\left(\frac{2}{3}\right)^2}$

	<u>Marks</u>
(a) $(27)^{-\frac{1}{3}} = 27^{\frac{1}{3}} = \sqrt[3]{27} = 3$	2
(b) $\frac{\left(\frac{3}{2}\right)^{-2} - \frac{2}{9}}{\left(\frac{2}{3}\right)^2} = \frac{\left(\frac{2}{3}\right)^2 - \frac{2}{9}}{\left(\frac{2}{3}\right)^2} = \frac{\frac{4}{9} - \frac{2}{9}}{\frac{4}{9}} = \frac{\frac{2}{9}}{\frac{4}{9}} = \frac{2}{9} \times \frac{9}{4} = \frac{1}{2} \text{ or } 0.5$	3
Total:	5

Problem 18. Solve the simultaneous equations:

(a) $2x + y = 6$

$5x - y = 22$

(b) $4x - 3y = 11$

$3x + 5y = 30$

	<u>Marks</u>
(a) $2x + y = 6$ (1)	
$5x - y = 22$ (2)	
Adding equations (1) and (2) gives: $7x = 28$ from which, $x = 4$	2
Substituting $x = 4$ in (1) gives: $8 + y = 6$ from which, $y = -2$	2
(b) $4x - 3y = 11$ (1)	
$3x + 5y = 30$ (2)	
$5 \times (1)$ gives: $20x - 15y = 55$ (3)	
$3 \times (2)$ gives: $9x + 15y = 90$ (4)	
(3) + (4) gives: $29x = 145$ and $x = \frac{145}{29} = 5$	3
Substituting $x = 5$ in (1) gives: $20 - 3y = 11$	
from which, $20 - 11 = 3y$ i.e. $9 = 3y$ and $y = 3$	3

Total:	10
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TOTAL MARKS FOR REVISION TEST 1: 100