

Carlingford High School



Year 9 (5.3) Mathematics

Term 4 Exam 2018

Print your Name: SOLUTIONS

Circle your class:

9MA31 (Mrs Blakeley)

9MA32 (Mr Gong)

9MA33 (Ms Bennett)

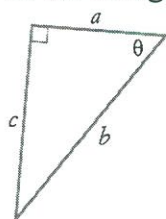
- Time allowed: **50 minutes**
- Approved calculators may be used
- Show all necessary working
- Marks may be deducted for untidy setting out
- Marks for questions are indicated in brackets

TOPICS	Marks	
Right-angles trigonometry	/21	
Single variable data analysis	/19	
Indices	/27	
TOTAL	/67	%

TRIGONOMETRY

1. In the triangle below, $\cos \theta =$

[1]



- (A) $\frac{a}{b}$ B $\frac{c}{b}$
C $\frac{c}{a}$ D $\frac{b}{a}$

2. Evaluate $\frac{12}{\cos 35^\circ}$

[1]

- A 12.02 (B) 14.65
C -13.28 D 0.34

3. $45^\circ 3'$ is the same as:

[1]

- (A) 45.05° B 45.3°
C 45.5° D 45.03°

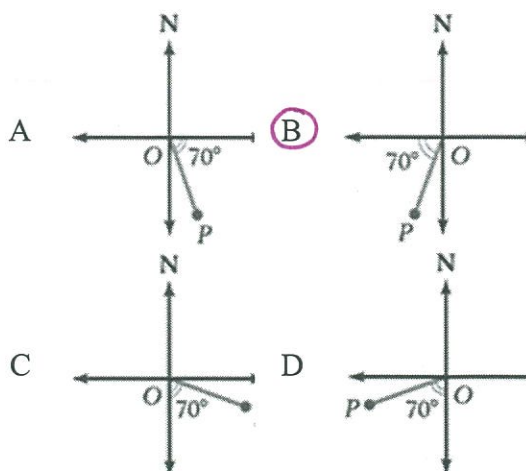
4. If $\cos \theta = 0.5$, what is the value of θ ?

[1]

- (A) 60° B 30°
C 1° D 53°

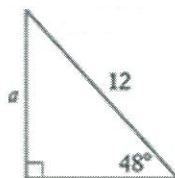
5. Which diagram shows P with a bearing of 200° from O ?

[1]



6. Find the length of a , correct to 2 decimal places.

[2]

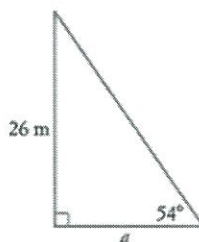


$$\begin{aligned}\sin 48^\circ &= \frac{a}{12} \\ a &= 12 \sin 48^\circ \\ &= 8.9177... \\ &= 8.92 \text{ (2dp's)}\end{aligned}$$

(1) - decimal place

7. Find the length of a , correct to 2 significant figures.

[2]

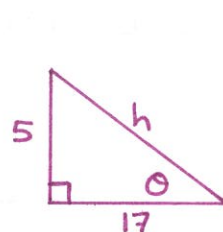


$$\begin{aligned}\tan 54^\circ &= \frac{26}{a} \\ a &= 26 \div \tan 54^\circ \\ &= 18.8901... \\ &= 19 \text{ m (2 sf's)}\end{aligned}$$

(1) - significant figures

8. A right-angled triangle has the ratio $\tan \theta = \frac{5}{17}$. Find the exact ratio of $\sin \theta$.

[3]



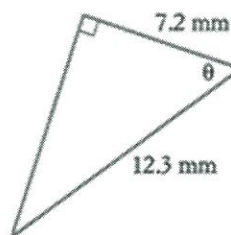
$$\begin{aligned}h^2 &= 5^2 + 17^2 \\ h &= \sqrt{314} \text{ (1) - hypotenuse}\end{aligned}$$

(1) - diagram
(1) - diagram

$$\begin{aligned}\sin \theta &= \frac{5}{\sqrt{314}} \\ &= \frac{5\sqrt{314}}{314} \text{ } \left. \begin{array}{l} \text{either} \\ \text{either} \end{array} \right\} \text{ (1) - solution}\end{aligned}$$

9. Find the value of θ , correct to the nearest minute.

[2]

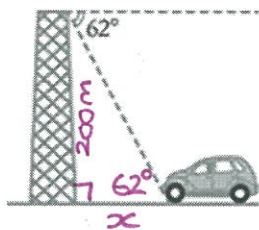


$$\cos \theta = \frac{7.2}{12.3} \text{ (1)}$$

$$\begin{aligned}\theta &= \cos^{-1} \left(\frac{7.2}{12.3} \right) \\ &= 54^\circ 10'\end{aligned}$$

(1) - minute

10. From the top of a 200 m tall tower, the angle of depression to a car is 62° . How far is the car from the foot of the tower? Answer to the nearest metre.



$$\tan 62^\circ = \frac{200}{x} \quad (1)$$

$$x = 200 \div \tan 62^\circ$$

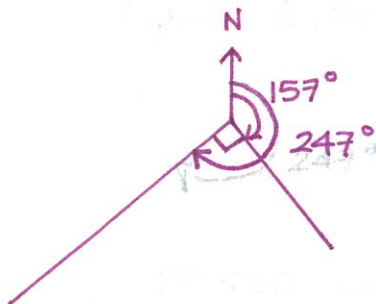
$$= 106.3418\dots$$

$$= 106 \text{ m (nearest m)}$$

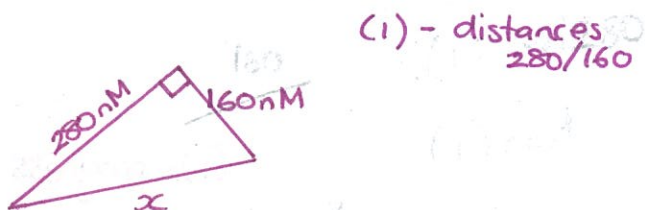
(1) - nearest m

11. Two ships leave from the same port. One ship travels on a bearing of 157° at 20 knots. The second ship travels on a bearing of 247° at 35 knots. (1 knot is a speed of 1 nautical mile per hour).

- (a) Draw a diagram to represent the information given in the question.



- (b) How far apart, in nautical miles, are the ships after 8 hours? Correct to 2 decimal places.



(1) - distances 280/160

$$x^2 = 160^2 + 280^2$$

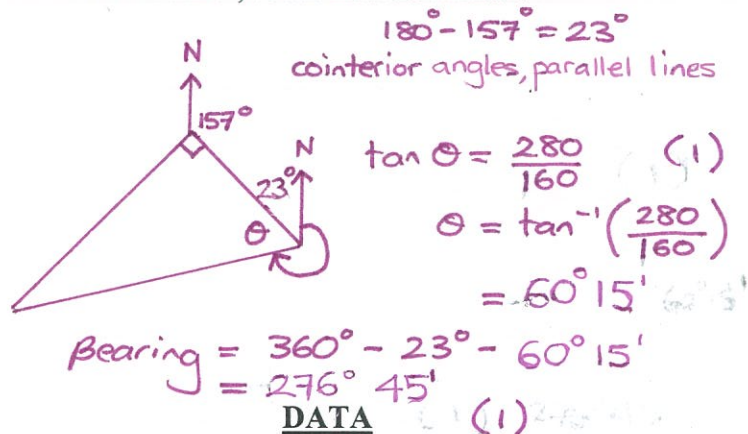
$$x = \sqrt{104\,000}$$

$$= 322.490\dots$$

$$= 322.49 \text{ nM (2dp's)}$$

(1) - solution (not dp's)

- (c) Calculate the bearing of the second ship from the first, to the nearest minute. [2]



1. Which of the following is an example of discrete quantitative data? [1]

- A a person's gender
B the speed of a car
☒ C shirt size
D the height of a person

2. The statistic that is not affected by an outlier is the: [1]

- A mean ☒ B mode
C range D median

3. (a) Complete the frequency table below. [2]

Score, x	Frequency, f	fx
4	12	48
5	8	40
6	7	42
7	4	28
	$\Sigma f = 31$	$\Sigma fx = 158$

- (b) Calculate the mean, correct to 2 decimal places. [1]

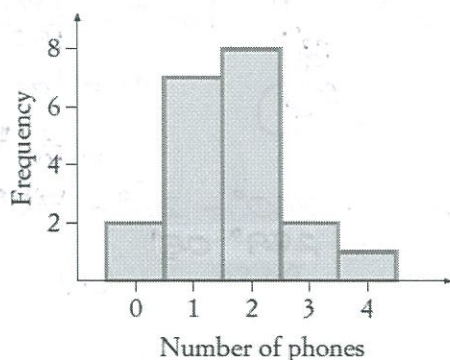
$$\bar{x} = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{158}{31} \quad (1) - \text{not rounding}$$

$$= 5.0967\dots$$

$$= 5.10 \text{ (2 dp's)}$$

4. Twenty households were surveyed about how many phones, including mobile phones, they owned. The results are shown in the frequency histogram below.



- (a) What is the mode? 2 [1]

- (b) Find the mean correct to 2 decimal places. [1]

$$= \frac{0 \times 2 + 1 \times 7 + 2 \times 8 + 3 \times 2 + 4 \times 1}{2 + 7 + 8 + 2 + 1}$$

$$= 1.65$$

- (c) Find the median. ($\Sigma f = 20$) [1]

$$\frac{2+2}{2} = 2$$

- (d) Find the range [1]

$$4 - 0 = 4$$

5. (a) Complete the cumulative frequency table below. [2]

Score	Frequency	Cumulative Frequency
32	5	5
33	8	13
34	12	25
35	9	34
36	7	41

- (b) Find the median. 34 [1]

6. This back-to-back stem-and-leaf plot shows the results of a Year 9 class in a Probability exam.

Boys		Girls
4 2	3	
9 8 7 4 3 0	4	5 7 8
9 9 9 6 5 3 2 2	5	3 4 4 9 9
7 4 4 1 0	6	0 3 4 4 7 7 7 8
4 3 2	7	0 1 5 5 8 8
5 2	8	4 8 8
1	9	0 9

- (a) Find the median score for: [2]

(i) boys 59

(ii) girls 67

- (b) The mean for the girls is 68.0. Calculate the mean for the boys, correct to one decimal place. [1]

$$\bar{x}(\text{boys}) = \frac{1575}{27}$$

$$= 58.3 \text{ (1dp)}$$

- (c) Who performed better on the test? Give reasons. [2]

Girls: (1)

$$(1) \begin{cases} \text{higher median } 67 > 59 \\ \text{higher mean } 68.0 > 58.3 \end{cases}$$

$$\cdot \text{lower range } 51 < 59$$

optional

7. Tamara scored a mean of 74% for 5 maths tests that she completed. Tamara did a sixth test and her mean test mark increased to 77%. What mark did she achieve in the last test? (1)-progress [2]

$$\frac{74 \times 5 + x}{6} = 77$$

$$370 + x = 462$$

$$x = 92\%$$

(1)-solution

INDICES

1. Simplify each expression:

(a) $9u^3v \times 6uv^2w^8 = 54u^4v^3w^8$ [1]

(b) $24m^8 \div 8m = 3m^7$ [1]

(c) $\frac{12x^5y^4}{16x^3y^5} = \frac{3x^2}{4y}$ or $\frac{3}{4}x^2y^{-1}$ [1]

(d) $(-2hj^5)^3 = -8h^3j^{15}$ [1]

(e) $\left(\frac{7k^2}{10}\right)^2 = \frac{49k^4}{100}$ [1]

(f) $-6r^0 = -6$ [1]

(g) $\left(\frac{8}{5}\right)^{-2} = \left(\frac{5}{8}\right)^2 = \frac{25}{64}$ [1]

(h) $(8w)^{\frac{2}{3}} = 4w^{\frac{2}{3}}$ [1]
 $4\sqrt[3]{w^2}$

2. Simplify each expression, using a positive index.

(a) $2b^{-5} = \frac{2}{b^5}$ [1]

(b) $(c^2d)^{-3} = \frac{1}{c^6d^3}$ [2]
(1) - progress
 $\frac{1}{(c^2d)^3}$ or $c^{-6}d^{-3}$
(1) - simplified/positive indices

3. Write $v^{\frac{2}{3}}$ using a radical (root) index. [1]

$\sqrt[3]{v^2}$ or $(\sqrt[3]{v})^2$

4. Write each expression using a fractional index.

(a) $\sqrt[7]{x} = x^{\frac{1}{7}}$ [1]

(b) $\sqrt[4]{(7n)^3} = (7n)^{\frac{3}{4}}$ [1]

5. Simplify each expression:

(a) $(18q^5r^8 \div 3q^2r^{-1})^2$ [2]
 $= (6q^3r^9)^2$ (1) - order operations
 $= 36q^6r^{18}$ (1) - solution

(b) $\left(\frac{64}{y^3}\right)^{-\frac{2}{3}} = \left(\frac{y^3}{64}\right)^{\frac{2}{3}}$ [2]
 $= \frac{y^2}{16}$ (1) - reciprocal
 (1) - solution

(c) $(27x^2)^{\frac{1}{3}} \div \frac{1}{3}(x^3)^{\frac{1}{2}}$ [3]
 (without a negative index)

$= 3x^{\frac{2}{3}} \div \frac{x^{\frac{3}{2}}}{3}$ (1) - simplifying
 $= 9x^{-\frac{5}{6}}$ (1) division
 $= \frac{9}{x^{\frac{5}{6}}}$ (1) - solution
 $\frac{9}{\sqrt[6]{x^5}}$ positive indices

6. Express 31 000 in scientific notation. [1]

3.1×10^4

7. Express 6×10^{-5} in decimal form: [1]

0.00006

8. Write each number correct to four significant figures.

(a) $23\,687\,149 = 23\,690\,000$ [1]
 2.369×10^7

(b) $0.000\,827\,036 = 0.000\,827\,0$ [1]
 8.270×10^{-4}

9. The distance light travels in one year is called a light year. If the speed of light is approximately 3×10^5 km/s, how far does light travel in a leap year? Answer in scientific notation, correct to three significant figures. [2]

$3 \times 10^5 \times 3600 \times 24 \times 366$ (1) - calc
 $= 9.49 \times 10^{12}$ km (1) - sf/sf

END OF EXAM