1. In an arithmetic sequence $u_1 = 7$, $u_{20} = 64$ and $u_n = 3709$.

    (a) Find the value of the common difference.

    (3)

    (b) Find the value of n.

    (2)

    (Total 5 marks)

2. Consider the arithmetic sequence 3, 9, 15, ..., 1353.

    (a) Write down the common difference.

    (1)

    (b) Find the number of terms in the sequence.

    (3)

    (c) Find the sum of the sequence.

    (2)

    (Total 6 marks)

3. Let $f(x) = \log_3 \sqrt{x}$, for $x > 0$.

    (a) Show that $f^{-1}(x) = 3^{2x}$.

    (2)

    (b) Write down the range of f^{-1}.

    (1)

    Let $g(x) = \log_3 x$, for $x > 0$.

    (c) Find the value of $(f^{-1} \circ g)(2)$, giving your answer as an integer.

    (4)

    (Total 7 marks)

4. Solve $\log_2 x + \log_2(x - 2) = 3$, for $x > 2$.

<div align="right">(Total 7 marks)</div>

5. (a) Find $\log_2 32$.

<div align="right">(1)</div>

(b) Given that $\log_2\left(\dfrac{32^x}{8^y}\right)$ can be written as $px + qy$, find the value of p and of q.

<div align="right">(4)</div>
<div align="right">(Total 5 marks)</div>

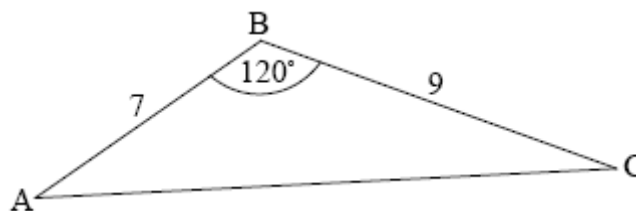**6.** Find the **exact** solution of the equation $9^{2x} = 27^{(1-x)}$.

<div align="right">(Total 6 marks)</div>

7. Let $p = \log_{10} x$, $q = \log_{10} y$ and $r = \log_{10} z$.

Write the expression $\log_{10}\left(\dfrac{x}{y^2 \sqrt{z}}\right)$ in terms of p, q and r.

<div align="right">(Total 6 marks)</div>

8. The following diagram shows triangle ABC.

diagram not to scale

AB = 7 cm, BC = 9 cm and $A\hat{B}C = 120°$.

(a) Find AC.

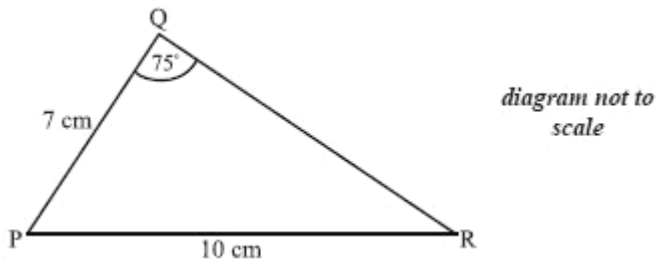<div align="right">(3)</div>

(b) Find $B\hat{A}C$.

<div align="right">(3)</div>
<div align="right">(Total 6 marks)</div>

9. The diagram below shows triangle PQR. The length of [PQ] is 7 cm, the length of [PR] is 10 cm, and PQ̂R is 75°.

diagram not to scale

(a) Find PQ̂R.

(3)

(b) Find the area of triangle PQR.

(3)
(Total 6 marks)

10. A ship leaves port A on a bearing of 030°. It sails a distance of 25 km to point B.
At B, the ship changes direction to a bearing of 100°. It sails a distance of 40 km to reach point C. This information is shown in the diagram below.
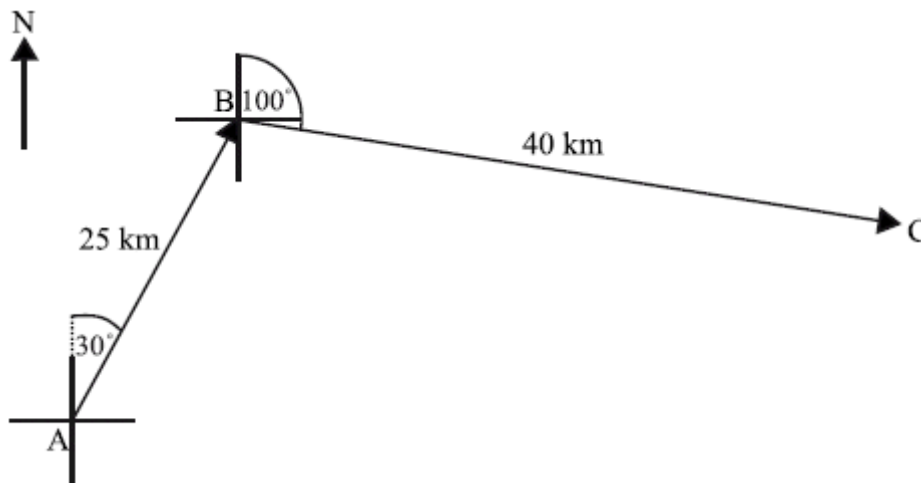
diagram not to scale

A second ship leaves port A and sails directly to C.

(a) Find the distance the second ship will travel.

(4)

(b) Find the bearing of the course taken by the second ship.

(3)
(Total 7 marks)

11. If P(A) = $\dfrac{1}{6}$, P(B) = $\dfrac{1}{3}$, and P($A \cup B$) = $\dfrac{5}{12}$, what is P($A'\,/\,B'$)?

(Total 6 marks)

12. Bag A contains 2 red and 3 green balls.

(a) Two balls are chosen at random from the bag without replacement. Find the probability that 2 red balls are chosen.

(2)

Bag B contains 4 red and n green balls.

(b) Two balls are chosen without replacement from this bag. If the probability that two red balls are chosen is $\dfrac{2}{15}$, show that $n = 6$.

(4)

A standard die with six faces is rolled. If a 1 or 6 is obtained, two balls are chosen from bag A, otherwise two balls are chosen from bag B.

(c) Calculate the probability that two red balls are chosen.

(3)

(d) Given that two red balls are chosen, find the probability that a 1 or a 6 was obtained on the die.

(4)
(Total 13 marks)